# UNITED STATES PATENT AND TRADEMARK OFFICE

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/643,370 | 08/19/2003 | James G. Droppo | M61.12-0522 | 4847 |

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| EXAMINER |
|---|
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| | Application No. | Applicant(s) |
|---|---|---|
| **Office Action Summary** | 10/643,370 | DROPPO ET AL. |
| | Examiner | Art Unit | |
| | Brian L. Albertalli | 2626 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

1) ☐ Responsive to communication(s) filed on _____.

2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

4) ☒ Claim(s) *1-23* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1-5 and 8-23* is/are rejected.

7) ☒ Claim(s) *6 and 7* is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

## Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 101*

1.      35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

2.      Claims 11-23 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 11-23 are directed to "A computer-readable medium". The specification defines computer readable media as including "carrier waves" and "modulated data signals" (see page 7 of the specification). These are equivalent to a so-called "signal". A signal, as a form of energy, does not fall within one of the four statutory classes of 35 U.S.C. 101 (process, machine, composition of matter, or manufacture), thus claims 11-23 are non-statutory.

### *Claim Rejections - 35 USC § 102*

3.      The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4.      Claims 1-5, 8-15, and 19-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Accardi et al. (U.S. Patent Application Publication 2002/0002455).

In regard to claim 1, Accardi et al. disclose a method of identifying an estimate for a clean signal random variable representing a portion of a clean signal found within a noisy signal, the method comprising:

defining a mapping random variable as a function of at least the clean signal random variable and a noise random variable (the DFT coefficients of a clean signal $X$ and noise signal $W$ are defined as random variables, page 1, paragraph 9; a random variable of the estimated amplitude $A$ is defined as set forth in equation 8, page 1, paragraph 11 to page 2, paragraph 14; the estimated amplitude $A$ is further defined as a function of the clean speech random variable $X$, see equations 9, 11, and 13, and a function of the noise random variable $W$, see equations 9, 12, and 14);

determining a model parameter that describes at least one aspect of a distribution of values for the mapping random variable (expected values of the speech random variable $X$ and the noise random variable $W$, page 2, paragraph 18 and equations 13 and 14); and

using the model parameter to determine an estimate for the clean signal random variable from an observed value (equations 13 and 14 are used to determine the estimated amplitude, which is used to determine the estimated clean signal random variable $X$, page 2, paragraph 14 and equation 7).

In regard to claim 2, Accardi et al. disclose defining the mapping random variable as a function of at least the clean signal random variable and the noise random variable

comprises defining the mapping variable as a ratio of the clean signal random variable to the noise random variable (signal to noise ratios, page 2, paragraph 18).

In regard to claim 3, Accardi et al. disclose determining a model parameter comprises determining a mean of the mapping random variable (an expected value of a random variable is equivalent to the mean of a random variable, equations 13 and 14 and page 2, paragraph 18).

In regard to claim 4, Accardi et al. disclose using the model parameter to determine an estimate of the mapping random variable (equations 13 and 14 are used to determine the estimated amplitude, page 2, paragraph 14 and equation 7).

In regard to claim 5, Accardi et al. disclose defining the mapping random variable as a function of at least the clean signal random variable and the noise random variable comprises defining the mapping variable as a ratio of the clean signal random variable to the noise random variable (signal to noise ratios, page 2, paragraph 18).

In regard to claim 8, Accardi et al. disclose determining a clean signal model parameter that describes at least one aspect of a distribution of values for the clean signal random variable (expected value of the clean speech, page 2, paragraph 18 and equation 13); and

using the clean signal model parameter to determine the estimate for the clean

signal random variable (equation 13 is used to determine the estimated amplitude,

which is used to determine the estimated clean signal random variable $X$, page 2,

paragraph 14 and equation 7).

In regard to claim 9, Accardi et al. disclose determining a noise model parameter

that describes at least one aspect of a distribution of values for the noise random

variable (expected value of the noise, page 2, paragraph 18 and equation 14); and

using the noise model parameter to determine the estimate for the clean signal

random variable (equation 14 is used to determine the estimated amplitude, which is

used to determine the estimated clean signal random variable $X$, page 2, paragraph 14

and equation 7).

In regard to claim 10, Accardi et al. disclose determining the noise model

parameter comprises determining the noise model parameter from noise estimates

collected from the noisy signal (determined from the noisy speech, page 2, paragraphs

19-21).

In regard to claim 11, Accardi et al. disclose a computer-readable medium having

computer-executable instructions for performing steps comprising:

defining a random variable as a function of a signal-to-noise ratio variable (a

clean speech random variable $X$ is defined as a function of a estimated amplitude $A$,

which is further defined as a function of a signal to noise ratio variable, page 2,

equations 7, 8, 11, and 12, and paragraphs 14 and 18; additionally, equation 8 defines

$R$, determined from noise, as a function of a signal to noise ratio variable);

determining distribution parameters for the signal-to-noise ratio based on the

defined function (expected values of the clean speech and noise, page 2, paragraph 18

and equations 13 and 14); and

using the distribution parameters to determine an estimate of the signal-to-noise

ratio (signal to noise ratios are estimated, page 2, paragraph 19).


In regard to claim 12, Accardi et al. disclose the random variable comprises a

clean signal random variable representing a portion of a clean signal ($X$ is a random

variable representing clean speech, page 2, paragraph 14).


In regard to claim 13, Accardi et al. disclose the random variable comprises a

noise signal random variable representing a noise in an observed signal ($R$ represents

noise observed in a signal, page 2, paragraph 19).


In regard to claim 14, Accardi et al. disclose defining a random variable further

comprises defining the random variable as a function of an observed value (the

estimated amplitude depends on R, see equation 8, which is determined from the

observed noisy speech, page 2, paragraph 19).

In regard to claim 15, Accardi et al. disclose determining a distribution parameter further comprises approximating at least a portion of the defined function with an approximation function (the a-priori SNR is estimated by equation 16, page 2, paragraphs 19 and 20).

In regard to claims 19 and 20, Accardi et al. disclose using the distribution parameter to determine an estimate of the random variable, where the random variable is a clean signal random variable representing a portion of the clean signal (equations 13 and 14 are used to determine the estimated amplitude, which is used to determine the estimated clean signal random variable $X$, page 2, paragraph 14 and equation 7).

In regard to claim 21, Accardi et al. disclose determining a distribution parameter further comprises determining the distribution parameter based on a model parameter that describes a distribution of clean signal values, each clean signal value representing a portion of a clean signal (expected value of the clean speech, page 2, paragraph 18 and equation 13).

In regard to claim 22, Accardi et al. disclose determining a distribution parameter further comprises determining the distribution parameter based on a model parameter that describes a distribution of noise values (expected value of the noise, page 2, paragraph 18 and equation 14).

In regard to claim 23, Accardi et al. disclose determining the model parameter from an observed signal (the estimated amplitude depends on R, see equation 8, which is determined from the observed noisy speech, page 2, paragraph 19).

### Allowable Subject Matter

5.      Claims 6 and 7 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:  Claim 6 requires approximating a function of the mapping random variable using a Taylor series expansion.  Accardi et al. provide no mention of a Taylor series expansion.  Furthermore, while the Taylor series expansion is well known, it is not readily apparent (i.e. obvious) how Accardi et al. could be modified to incorporate a Taylor series expansion to approximate a function of the mapping random variable.

### Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.  Ephraim et al. (*Speech Enhancement Using a Minimum Mean-Square Error Short-Time Spectral Amplitude Estimator* and *Speech Enhancement Using a Minimum Mean- Square Error Log-Spectral Amplitude Estimator*) disclose using a signal to noise ratio as a random variable.  Attias et al. (*A New Method for Speech Denoising and Robust Speech Recognition Using Probabilistic Models for Clean*

*Speech and for Noise*) disclose defining clean speech and noise as random variables. Kim et al. (U.S. Patent 6,778,954) disclose defining the signal to noise ratio as a random variable. Boll et al. (U.S. Patent 4,897,878) disclose defining an optimal estimator as the ratio of two random variables.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian L. Albertalli whose telephone number is (571) 272-7616. The examiner can normally be reached on Mon - Fri, 8:00 AM - 5:30 PM, every second Fri off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Hudspeth can be reached on (571) 272-7843. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

BLA 4/26/07

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